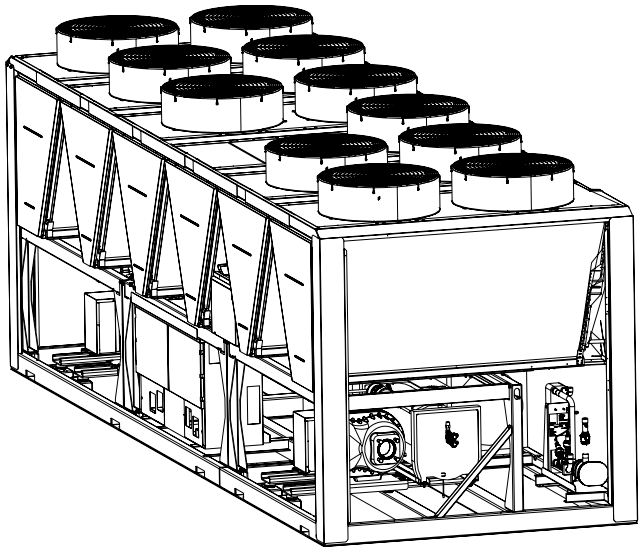
Carrier

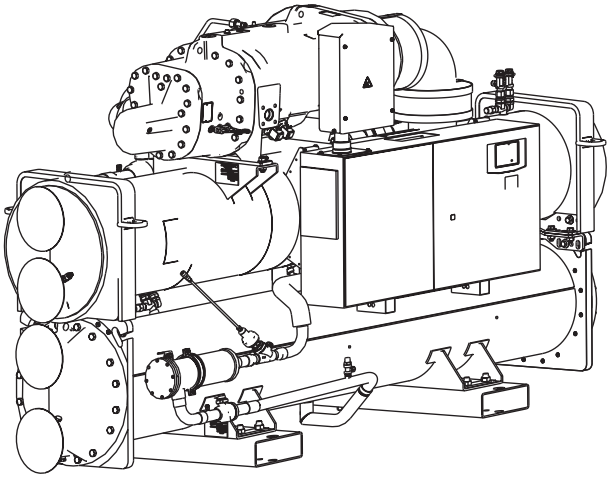
30XA/30XW

PRO-DIALOG Control

30XA



30XW



Operation and maintenance instructions

LLOYD'S REGISTER QUALITY ASSURANCE ISO9001

UKAS QUALITY MANAGEMENT 001

Quality Management System Approval

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1 - SAFETY CONSIDERATIONS

1.1 - General

Installation, start-up and servicing of equipment can be hazardous if certain factors particular to the installation are not considered: operating pressures, presence of electrical components and voltages and the installation site (elevated plinths and built-up up structures). Only properly qualified installation engineers and highly qualified installers and technicians, fully trained for the product, are authorised to install and start-up the equipment safely. During all servicing operations all instructions and recommendations which appear in the installation and service instructions for the product, as well as on tags and labels fixed to the equipment and components and accompanying parts supplied separately, must be read, understood and followed.

- Apply all standard safety codes and practices.
- Wear safety glasses and gloves.
- Use the proper tools to move heavy objects. Move units carefully and set them down gently.

1.2 - Avoid electrocution

Only personnel qualified in accordance with IEC (International Electrotechnical Commission) recommendations may be permitted access to electrical components. It is particularly recommended that all sources of electricity to the unit be shut off before any work is begun. Shut off the main power supply at the main circuit breaker or isolator.

IMPORTANT: This equipment uses and emits electromagnetic signals. Tests have shown that the equipment conforms to all applicable codes with respect to electromagnetic compatibility.

RISK OF ELECTROCUTION: Even when the main circuit breaker or isolator is switched off, certain circuits may still be energised, since they may be connected to a separate power source.

RISK OF BURNS: Electrical currents cause components to get hot either temporarily or permanently. Handle power cable, electrical cables and conduits, terminal box covers and motor frames with great care.

2 - GENERAL DESCRIPTION

2.1 - General

Pro-Dialog is a system for controlling dual- or triple circuit 30XA air-cooled liquid chillers or 30XW water-cooled chillers. Pro-Dialog controls compressor start-up needed to maintain the desired heat exchanger entering or leaving water temperature. It controls the operation of the fans (air-cooled units) to maintain the correct condensing pressure in each circuit. Safety devices are constantly monitored by Pro-Dialog to ensure their safe operation. Pro-Dialog also gives access to a Quick Test program covering all inputs and outputs.

All Pro-Dialog controls can work in accordance with three independent modes:

- Local mode: the machine is controlled by commands from the user interface.
- Remote mode: the machine is controlled by volt-free contacts.
- CCN mode: the machine is controlled by commands from the Carrier Comfort Network (CCN). In this case, a data communication cable is used to connect the unit to the CCN communication bus.

The operating mode must be chosen with the Start/Stop button described in section 4.9.1. When the Pro-Dialog system operates autonomously (Local or Remote mode) it retains all of its own control capabilities but does not offer any of the features of the CCN network.

2.2 - Abbreviations used

In this manual, the refrigeration circuits are called circuit A, circuit B and circuit C.

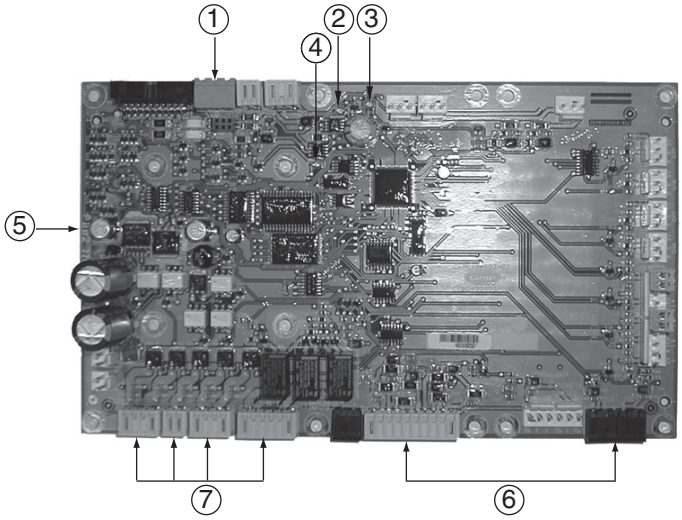
The following abbreviations are used frequently:

CCN	:	Carrier Comfort Network
CCN mode	:	Operating type: CCN
EXV	:	Electronic Expansion Valve
LED	:	Light Emitting Diode
LEN	:	Sensor Bus (internal communication bus linking the basic board to the slave boards)
Local-Off	:	Operating type: Local Off
Local-On	:	Operating type: Local On mode
Local-Schedule	:	Operating type: Local On following a time schedule
Master mode	:	Operating type: master unit (master/slave assembly)
Remote mode	:	Operating type: by remote contacts
SCT	:	Saturated Condensing Temperature
SST	:	Saturated Suction Temperature

3 - HARDWARE DESCRIPTION

3.1 - General

Control board



Legend
1 CCN connector
2 Red LED, status of the board
3 Green LED, communication bus LEN
4 Orange LED, communication bus CCN
5 PD5 basic board
6 Remote customer control connection contacts
7 Master board customer connection relay outputs

The control system consists of a PD5-BASE board, TCPM boards for compressor control, PD-AUX boards for fan control or a three-way valve for water-cooled units, and an NRCP2-BASE board for units equipped with energy management option or heat reclaim option. All boards communicate via an internal LEN bus. The PD5-BASE boards continuously manage the information received from the various pressure and temperature probes, and incorporates the program that controls the unit.

The user interface is a touch screen. It is connected to the main basic board and gives access to a full array of control parameters.

3.2 - Electrical supply to boards

All boards are supplied from a common 24 V a.c. supply referred to earth.

CAUTION: Maintain the correct polarity when connecting the power supply to the boards, otherwise the boards may be damaged.

In the event of a power supply interrupt, the unit restarts automatically without the need for an external command. However, any faults active when the supply is interrupted are saved and may in certain cases prevent a circuit or unit from restarting.

3.3 - Light emitting diodes on boards

All boards continuously check and indicate the proper operation of their electronic circuits. A light emitting diode (LED) lights on each board when it is operating properly.

- The red LED flashing for a 2 second period on the NRCP-BASE board indicates correct operation. A different rate indicates a board or a software failure.
- The green LED flashes continuously on all boards to show that the board is communicating correctly over its internal bus. If the LED is not flashing, this indicates a LEN bus wiring problem.
- The orange LED of the master board flashes during any communication via the CCN bus.

When the unit is energised, all boards must flash in a synchronised way. If a board does not flash at the same time as the others, verify its connection at the LEN bus.

3.4 - The sensors

Pressure sensors
Two types of electronic sensors are used to measure the following pressures in each circuit:

- Discharge gas pressure (high pressure type)
- Suction pressure (low pressure type)
- Oil pressure (high pressure type)
- Economizer pressure (high pressure type)

These electronic sensors deliver 0 to 5 V d.c. The economizer and oil pressure sensors are connected to the TCPM board and, like the others, are measured by the basic board or the auxiliary board for circuit C.

Discharge pressure sensors
These are on the high pressure side of each circuit. They are used to control head pressure or high pressure load shedding.

Oil pressure sensors
These sensors are located at the oil pressure port of each compressor.

Suction pressure sensors
They measure the low-pressure side of each circuit.

Economizer pressure sensors
These sensors measure the intermediate pressure between high and low pressure. They are used to control the economizer performance.

Heat reclaim condenser outlet pressure sensors
These optional sensors (for air-cooled units with heat reclaim option) permit control of the load in the heat reclaim mode.

Thermistors
These all have similar characteristics.

Evaporator entering and leaving water temperature sensor
The evaporator entering and leaving water temperature sensors are installed in the entering and leaving side water box.

Discharge gas sensor
This sensor is used to control the discharge gas temperature, and permits control of the discharge superheat temperature. It is located in the discharge line of each compressor.

Suction gas sensor
This sensor is used to control the suction gas temperature. It is located in the suction line of each compressor.

Motor sensor
This is used to control the motor temperature of each compressor.

Condenser entering/leaving water temperature sensor
These sensors measure the entering and leaving water temperatures in water-cooled units or air-cooled units with the heat reclaim option.

Temperature setpoint reset sensor
This is an optional 4-20 mA sensor (energy management option) which can be installed remotely from the unit. It is used to reset the setpoint on the unit.

Outdoor temperature sensor
Mounted on the control box of air-cooled units only. It is used for start-up, setpoint temperature reset and frost protection control.

Master/slave assembly temperature control
The optional water temperature sensor can be used for master/slave assembly control.

3.5 - The controls

Evaporator pumps
The controller can regulate one or two evaporator pumps and takes care of the automatic changeover between pumps.

Condenser pump
In water-cooled units the controller can regulate a condenser pump.

Electronic expansion valve (EXV)
The EXV is used to adjust the refrigerant flow to changes in the operating conditions of the machine. To adjust the refrigerant flow, a piston moves constantly up or down to vary the cross-section of the refrigerant path. This piston is driven by an electronically controlled linear stepper motor. The high degree of accuracy with which the piston is positioned ensures that the flow of refrigerant is precisely controlled.

The water flow switch configuration
This permits automatic control of the minimum water flow setpoint of the water flow switch.

The oil heater
Air-cooled units have one oil heater for each circuit. They are only controlled if the compressor is not operating and in accordance with the outside temperature.

Evaporator heater
In air-cooled units this optional control protects the evaporator (and the pipe heater for units without pump) against freezing if the unit is off. An optional board is required.

3.6 - Connections at the user's terminal block

3.6.1 - General description
The contacts below are available at the user's terminal block on the PD5-BASE board (see figure of the control board). Some of them can only be used if the unit operates in remote operating type (Remote mode).

The following table summarises the connections at the user's terminal block.

COOLING ONLY UNITS				
Description	**Connector/channel**	**Terminal**	**Board**	**Remarks**
Evaporator pump 1 control	J2A / Ch19		PD5-BASE	The control can regulate one or two evaporator pumps, and automatically change over between the two pumps.
Evaporator pump 2 control	J2A / Ch20		PD5-BASE	The control can regulate one or two evaporator pumps, and automatically change over between the two pumps.
Water flow switch configuration control	J2B / Ch21		PD5-BASE	Permits configuration of the water flow switch. If the configuration is not correct, an alarm is generated.
Oil heater control (air-cooled units only)	J2C / Ch22-23 of the PD5-BASE board or Ch10 of the TCPM board		PD5-BASE for units without economizer, TCPM for the others	Only controlled if the compressor is not operating. Depends on the outside temperature.
Condenser pump control (water-cooled units only)	J2C/Ch22		PD5-BASE	Allows control of the condenser pump of each circuit.
Alarm relay output	J3 / Ch24		PD5-BASE	Indicates alarms
Alert relay output	J3 / Ch25		PD5-BASE	Indicates alerts
Operation or ready-to-start relay output	J3 / Ch26		PD5-BASE	Indicates if the unit is ready to start or operates.
Contact 1: Start/stop	J4 / Ch11	32-33	PD5-BASE	This contact is used to control unit start/stop. It is only taken into consideration, if the unit is in the remote operating mode (Remote mode).
Contact 2: Second setpoint selection	J4 / Ch12	65-66	PD5-BASE	This contact is only taken into consideration, if the unit is in the remote operating mode (Remote mode).
Contact 3: Demand limit selection 1	J4 / Ch13	63-64	PD5-BASE	See the description in section 3.6.4.
Contact 3 bis: Demand limit selection 2	Ch9		NRCP2-BASE	This contact is only present if the energy management option is used (see section 3.6.3).
User safety loop input	J4 / Ch10 only with energy management option		NRCP2-BASE	This contact is used for user safety loops that require a unit shut down if it is closed. This contact is only present, if the energy management option is used.
Contact 4: Heat reclaim option Free cooling option	J4 / Ch14		PD5-BASE	Heat reclaim option: this contact is used to signal to the control that the heat reclaim option is present. Free cooling option: this contact is used to block the operation of the free cooling option.
Contact 4: Heating/cooling mode selection (water-cooled Heat Machine units only)	J4 / Ch14		PD5-BASE	This contact is not taken into consideration when the unit is in Remote mode.
Contact 5: Pump operation status	J5C / Ch18		PD5-BASE	If this contact is open, while the pump is controlled to On, an alarm is tripped.
Contact 6: Water flow switch	J5B / Ch17		PD5-BASE	If this contact is open when the unit is operating, an alarm is tripped.
Connection to CCN	J12		PD5-BASE	An RS-485 bus is used for connection to the CCN. - Pin 1: signal + - Pin 2: ground - Pin 3: signal -

3.6.2 - Volt-free setpoint selection

This volt-free contact permits selection of the second set-point. The setpoints can be modified in the setpoint table.

	Cooling		Heating	
	CSP 1	**CSP2**	**HSP1**	**HSP2**
Contact 2	Open	Closed	Open	Closed

3.6.3 - Volt-free demand limit contact with energy management option

For units with the energy management option the demand limit contact 3bis is located on the NRCP2-BASE board and contact 3 is on the PD5-BASE board. Demand limit is now multiplexed.

	Capacity			
	100%	**lim_sp1**	**lim_sp2**	**lim_sp3**
Contact 3	Open	Closed	Open	Closed
Contact 3 bis	Open	Open	Closed	Closed

3.6.4 - Volt-free demand limit contact without energy management option

For units without energy management option, contact 3 is located on the PD5-BASE board.

	Capacity	
	100%	**lim_sp1**
Contact 3	Open	Closed

4 - SETTING UP THE PRO-DIALOG CONTROL

4.1 - User interface general features

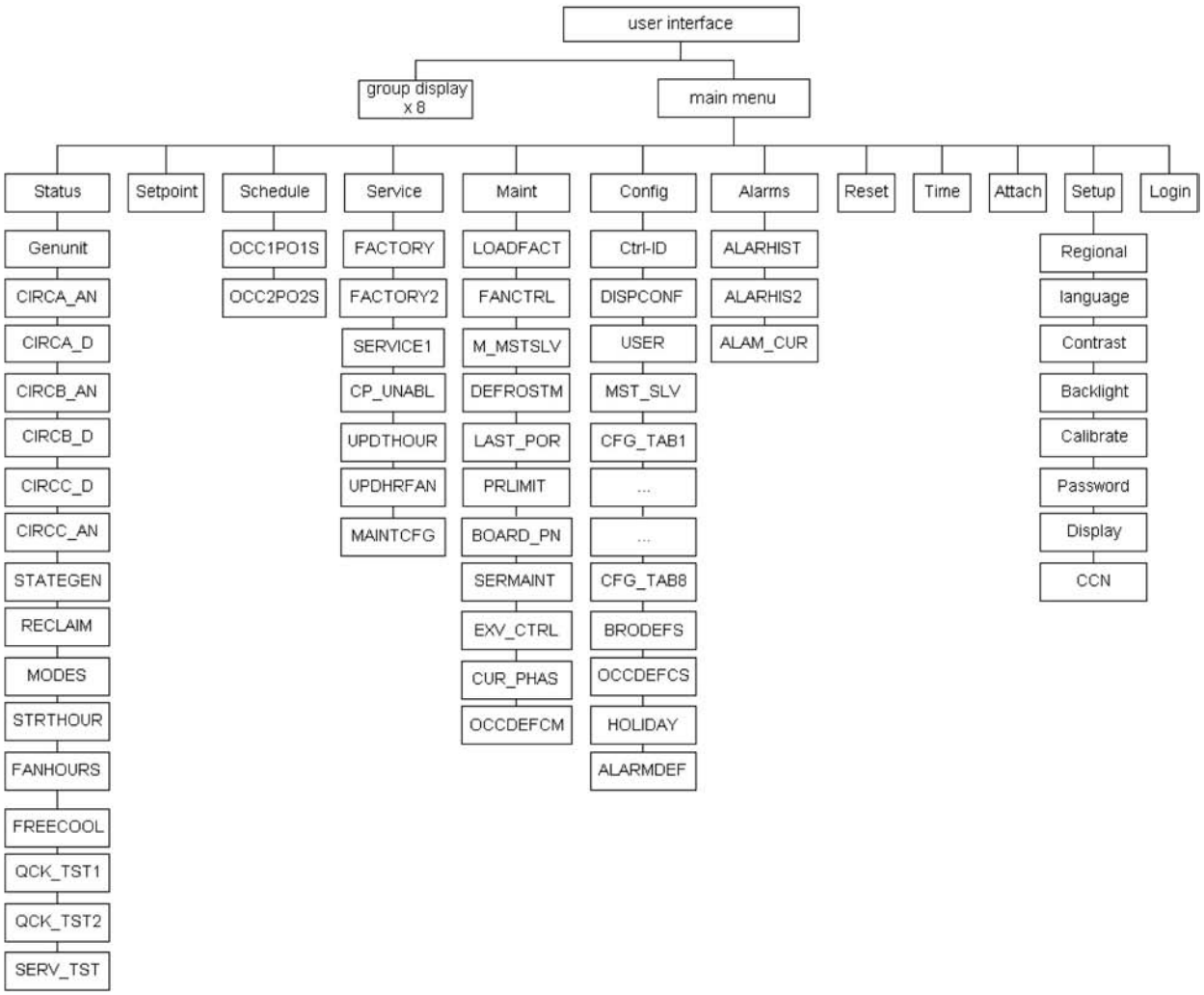
The main interface is a touch screen interface. The menu or action selection is made by pressing directly on the screen. This allows display and modification of certain operating parameters.

It is recommended to use a pen for the navigation via the touch screen. It prevents screen maintenance and allows more precision during the selections.

NOTE: All images shown for the interface in this document are for illustration purposes. They show English texts that can be translated into local languages. To select the display language, see section 4.4.7.

DESCRIPTION OF THE MAIN NAVIGATION AND OPERATION BUTTONS	
	Returns to the previous screen
	Displays the default screen (“Group Display” screen)
	Displays the main screen
	Displays the next screen
	Displays the previous screen
	Accepts the current action
	Rejects the current action
	Cancels the current action
	Removes the data in the value modification dialog box
	Adds a point to one of the “Group Display” screens
	Removes a point from one of the “Group Display” screens
	Reduces/increases the value
	Displays the previous/following item
	Displays the previous/following page
	Forces a point
	Cancels the forcing of a point
	Displays the value modification dialog box for a point
	Alarm indication light
	Start/stop control button

4.2 - General navigation architecture



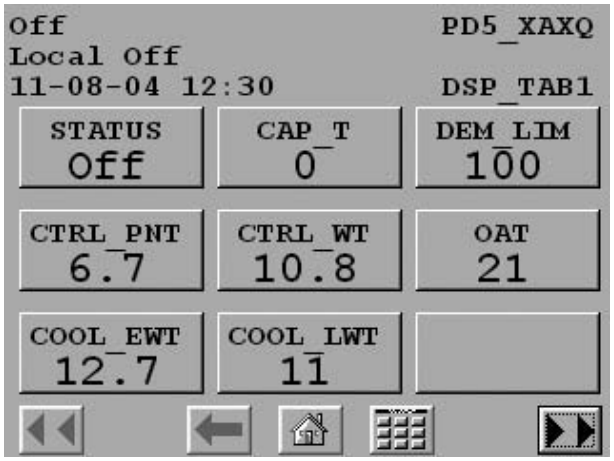
4.3 - "Group Display" screens

4.3.1 - Characteristics

The interface allows the user to personalise up to eight "Group Display" schreens. Each screen contains up to nine parameters. These parameters are selected from the unit points and permit display of the name, value and description of the point.

By default five screens are set up at the factory to permit quick access to the unit parameters such as entering water temperature, leaving water temperature, current unit capacity, active setpoint, outside air temperature, discharge and suction pressure etc.

Fig. 1 - Example of the first default "Group display" (see note in section 4.1)



At start-up or after a long inactive period the interface goes to the first "Group Display" screen.

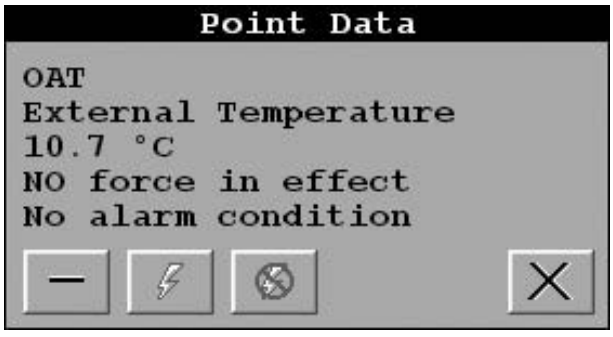
The navigation between the screens is via the buttons at the bottom of the screen.

4.3.2 - Personalisation

The user can personalise these screens by adding or removing points.

If a point is pressed, a dialogue box appears that contains the buttons to remove or force the point.

Fig. 2 - Dialogue box for a "Group Display" point (see note in section 4.1)



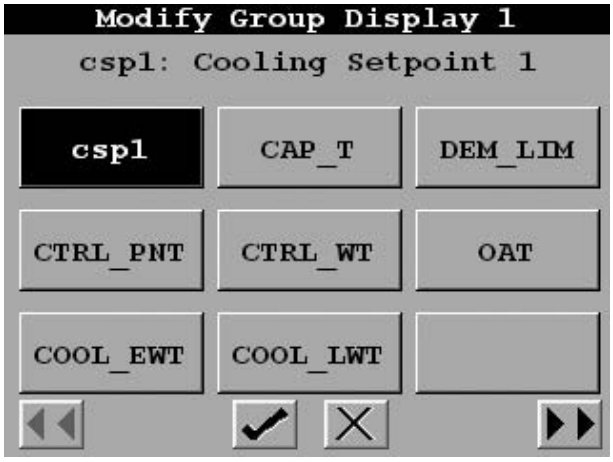
Adding a point to the "Group Display"

In the main menu select one of the buttons Status, Setpoint, Schedule or Maint.

Then select the table that contains the point to add. Select the point to launch the dialogue box. In this box press the add button:

Use the navigation buttons to select the "Group Display" and then choose the position. To add the point and return to the "Group Display" press the validation button:

Fig. 3 - Addition of a point in a "Group Display" (see note in section 4.1)



Remove a point from the "Group Display"

In the dialogue box for the point press the button:

4.4 - Description of the main menu

The button gives access to the main menu.

Fig. 4 - Main menu

4.4.1 - Description of the table sub-menus

The following buttons allow access to the status, service, setpoint, maintenance and configuration tables. Simply select the table you want to display.

4.4.1.1 - Status sub-menu

GENUNIT: This table contains the general unit operating parameters, such as the operating status, the current alarms, the unit capacity or the setpoint.

CIRCA_AN, CIRCB_AN, CIRCC_AN: These tables contain the circuit parameters with an analogue value, such as suction and discharge pressures, suction and discharge motor temperatures or EXV position.

CIRCA_D, CIRCB_D, CIRCC_D: These tables contain the circuit variables with a discrete input/output, for example fan output, compressor output or oil level.

STATEGEN: This table contains the general unit status parameters, for example the water entering and leaving temperatures, the pump status and the alert or alarm output status.

RECLAIM: This table contains the heat reclaim option parameters, for example the heat reclaim condenser water entering and leaving temperatures.

MODES: This table permits the display of the operating modes that are activated.

STRTHOUR: This table permits the display of the number of operating hours and the number start-ups for the compressors and pumps.

FANHOURS: This table permits the display of the number of operating hours for the fans.

FREECOOL: This table contains the parameters for the free cooling option, for example the estimated cooling capacity.

QCK_TST1 et QCK_TST2: These tables permit the manual test of different unit parts, such as the various valves, the fans or the EXVs.

SERV_TST: This table permits the manual test of the unit; it is not used in Europe.

4.4.1.2 - Setpoint table

This table permits the modification of the setpoints, for example the water temperature setpoints.

4.4.1.3 - Service sub-menu

The tables in this menu are protected by a service password and may only be changed by a Carrier service technician.

FACTORY: This table contains the main unit configuration, such as the size and the options. This configuration is entered at the factory.

FACTORY2: This table contains the detailed unit configuration. This configuration is automatically generated in accordance with the values in the table FACTORY.

SERVICE1: This table contains the main unit operating parameters, for example the medium used or the superheat or approach setpoints.

CP_UNABL: This table permits manual deactivation of one or several compressors.

UPDTHOUR: This table permits updating of the operating hours in the table STRTHOURS when the software application of the main board is reloaded.

UPDHRFAN: This table permits updating of the operating hours in the table FANHOURS when the software application of the main board is reloaded.

MAINTCFG: This table permits updating of the values in the preventive maintenance table SERMAINT.

4.4.1.4 - Sub-menu Maint

The tables in this sub-menu are for the Carrier service technicians.

LOADFACT: This table permits the display of the parameters associated with the unit capacity control, for example the current values for 30% and 100%.

FANCTRL: This table permits the display of the of the parameters associated with fan control, such as the saturated condensing temperature control point.

M_MSTSLV: This table permits the display of the of the parameters associated with master/slave control.

DEFROSTM: This table permits the display of the parameters associated with the defrost function.

LAST_POR: This table permits the display of the history of the last power cuts on the control.

PRLIMIT: This table allows the user to find out the compressor operating limits, in heating mode only.

BOARD_PN: This table allows the user to find out the serial numbers of the slave boards and the configuration of the compressor boards.

SERMAINT: This table permits the display of the time remaining before the next preventive maintenance operations.

EXV_CTRL: This table permits the display of the parameters associated with the EXV control, such as suction and discharge overheat temperatures.

CUR_PHAS: This table permits the display of the current per phase of the three compressors.

OCCDEFCM: This table and the associated sub-tables permit the display of the unit occupation periods.

4.4.1.5 - Sub-menu Config.

The tables in this sub-menu are for the Carrier service technicians.

CTRL_ID: This table allows the user to find out the software version for the unit.

DISPCONF: This table allows the selection of the language and the unit type for the remote interface.

USER: This table allows control of the different user parameters such as the compressor loading type or the validation of the pumps.

MST_SLV: This table permits unit configuration in master/slave mode.

CFG_TAB1-8: These tables permit manual configuration of the display groups. Direct modification of these tables without going through the procedure described section 4.3.2 is not recommended.

BRODEFS: This table permits the activation of the broadcast function and the configuration of the summer/winter time function.

OCCDEFCS: This table and the associated sub-tables permit the configuration of the time schedules, but it is recommended to use the schedule menu (section 4.4.2).

HOLIDAY: This table permits the configuration of the holiday periods.

ALARMDEF: This table permits the configuration of the network (POC) alarms.

4.4.2 - Schedule

The following button allows the display of the time schedule tables.

OCC1PO1S: This time schedule table permits the configuration of the unit operating and shut-down time schedules.

OCC2PO2S: This time schedule table permits the configuration of the time schedules for the use of setpoints 1 and 2.

4.4.3 - Alarms

The following button permits the user to display the active unit alarms.

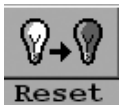
ALARHIST: This table allows access to the history of all alarms.

ALARHIS2: This table allows access to the history of the process type alarms.

ALAM_CUR: This table allows access to the current alarms.

4.4.4 - Reset

The following button permits cancelling the current alarms.



4.4.5. Time

The following button permits the user to modify the time and date for the unit.

4.4.6 - Attach

The following button permits updating the tables, languages and the type font in the unit. Updating is required each time the control software has been loaded.

4.4.7 - Setup

The following button permits access to the parameter setting and configuration of the interface.

Fig. 5 - Interface configuration menu (see note in section 4.1)

Regional	Set the parameter for the time and date format and the unit type to be used.
Language	Select the language and type font to be used.
Contrast	Adjust the contrast of the LCD screen. To increase the contrast, press button: To reduce the contrast, press button:
Backlight	Activates the backlighting mode.
Calibrate	Calibrates the touch screen. To carry out the calibration, press the circle at the top left, then the circle at the bottom right. Thise function is protected by the service password.
Passwords	Configures the customer and service passwords. All passwords are made up of four digits. The service password allows the user read/write access in all tables. The customer password allows the user read/write access in the available tables, except the service configuration tables. Read/write access is possible for the configuration of the interface except for the password menu and for the CCN menu.
Display	Displays the Ctrl-ID table that contains information such as the software version, the operating mode and the interface mode.
CCN	Modifies the CCN data (address, communication speed) when the interface is in CCN mode.

4.4.8. - Login/Logout

The following button permits display of the dialogue box “Login”. After that simply enter the 4-digit password. The button then changes to “Logout”. Two access levels are possible, the limited mode and the total mode.

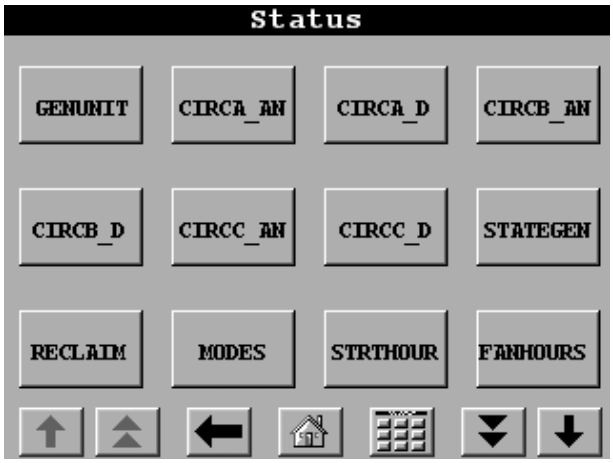
The following button allows disconnection and return to the read only mode. If the interface is not used for 15 minutes, it is automatically disconnected.

4.5 - Table description

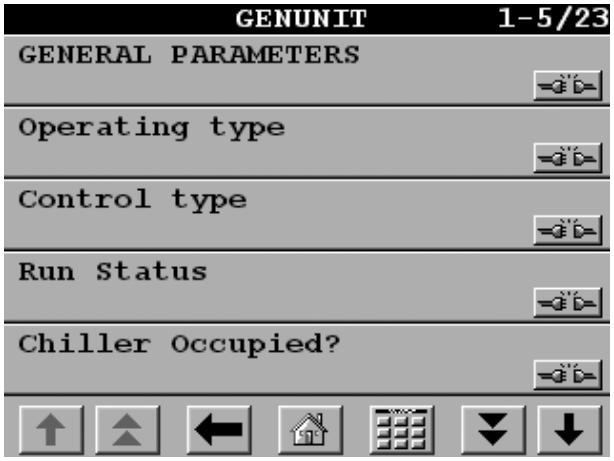
4.5.1 - Reading a point

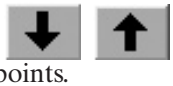
The buttons described in section 4.4.1 permit access to the service status, setpoint etc. tables.

Once a sub-menu has been selected, the list of tables is displayed (see note in section 4.1):



The selection of the required table permits the display of all points present in this table (see note in section 4.1):



The buttons and  permit the display of the previous or next points.

4.5.2 - Modification of a point

4.5.2.1 - Writing a point

The Setpoint, Service and Configuration tables are accessible in write mode.

Example: Setpoint table (see note in section 4.1):

When "Cooling setpoint 2" is selected (in English - see note in section 4.1), the following dialogue box appears:

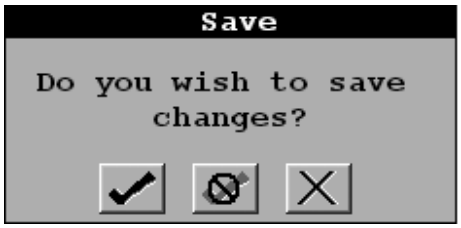
The following button permits access to the modification dialogue box (see note in section 4.1):

To validate the selection use the button:

IMPORTANT: The new value of point csp 2 is only transmitted to the control after quitting the Setpoint table.

After one of the following quit buttons is pressed

the following dialogue box is displayed (see note in section 4.1):



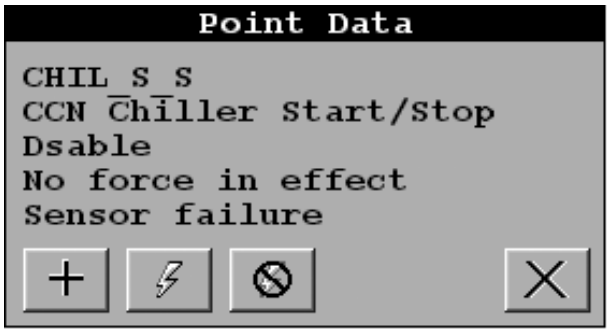
ATTENTION: The new value of point csp2 (and any other point modified in this table) is transmitted to the control after this window has been validated.

4.5.2.2 - Forcing a point

This concerns the Status and Maintenance tables.

Example: Genunit table (see note in section 4.1):

When the point “CCN chiller start/stop” is selected (see note in section 4.1), the following window appears:



The following button permits access to the Forcing dialogue box (see note in section 4.1):

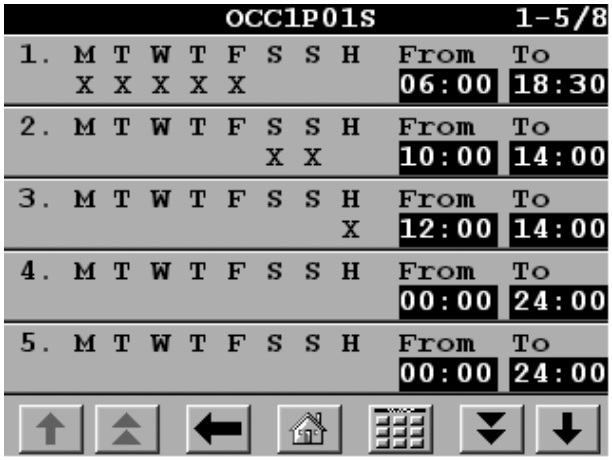
To validate the selection use the button:

In this case the new point value is directly transmitted to the control.

4.6 - Time schedule table

4.6.1 - Description

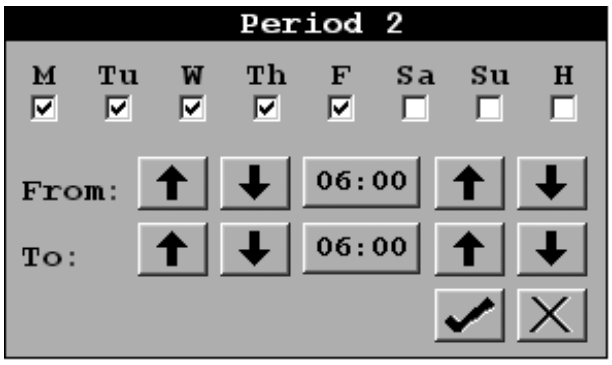
The time schedule tables are accessible from the main menu. Two tables are available (see section 4.4.2). After one of these two tables has been selected, the following screen appears (see note in section 4.1):


OCC1P01S 1-5/8
1. M T W T F S S H From To
X X X X X 06:00 18:30
2. M T W T F S S H From To
X X 10:00 14:00
3. M T W T F S S H From To
X 12:00 14:00
4. M T W T F S S H From To
00:00 24:00
5. M T W T F S S H From To
00:00 24:00

Each line represents a time schedule. The letters M-T-W... S-S represent the days of the week and the H the holidays; the tick indicated under the days shows that they are selected. The time schedules on the right of the screen define the selected time schedule range.

4.6.2 - Modification

When a line has been selected, after the password has been entered, the following screen appears (see note in section 4.1):



The days in the time schedule program are indicated at the top of the screen and selectable by clicking the square below.

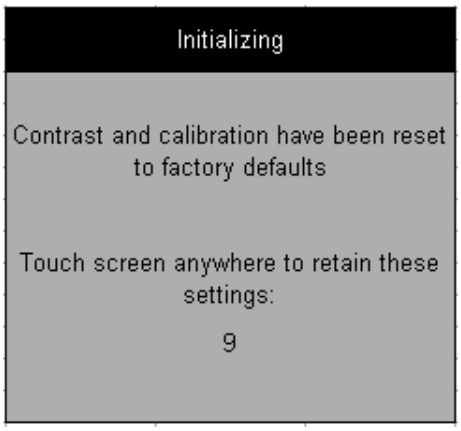
The time schedules can be modified with the arrow buttons. The arrow buttons on the left permit changing the hours, those on the right permit changing the minutes.

To validate the program press the button:

ATTENTION: As for the write mode of the points, the modifications in the time schedule program are only applied after quitting the table and validating a confirmation screen (see section 4.5.2.1).

4.7 - Re-initialisation of the display

To re-initialise the display with the factory parameters leave the finger pressed on the screen when it is switched on. When the screens goes white, remove the finger from the screen. The following dialogue box appears (see note in section 4.1):


Initializing
Contrast and calibration have been reset to factory defaults
Touch screen anywhere to retain these settings:
9

To confirm the modification touch the screen above for 10 seconds.

4.8 - Translation of the display and the control

The 30XA/30XW control allows the user two different languages: English and an optional language loaded at the factory in accordance with the destination country of the unit.

The language selection is made in the Setup => Language menu. When the new language is selected, a new interface update for the control is necessary as all texts are effectively updated.

4.9 - Unit start/stop control

4.9.1 - Description

The main interface includes a start/stop button that allows:

- shutting down the machine,
- selecting an operation mode.

4.9.2 - Starting up and operation type selection

The unit is started up by pressing the start/stop button. The window below appears.

Fig. 6 - Unit start-up screen (see note in section 4.1)

The unit start-up screen (Fig. 6) allows the selection of the operation type.

Local on	Local start: The unit is in the local control mode and allowed to start.
Local schedule	Clock-controlled local operation: the unit is in local control mode. If the period is occupied, it is allowed to start. If the unit run time schedule is in unoccupied mode, it is kept shut down until the next occupied period.
CCN mode	CCN: The unit is controlled by CCN commands.
Remote mode	Remote: the unit is controlled by external contacts.
Master mode	Master unit: the unit operates as a master unit in a master/slave assembly (only displayed if the unit is configured for master/slave control).

After the selection an acceptance window is displayed.

Fig. 7 - Acceptance window (see note in section 4.1)

4.9.3 - Shutting down the unit in local mode

Shut-down is confirmed by the following window.

Fig. 8 - Unit shut-down screen (see note in section 4.1)

5 - PRO-DIALOG CONTROL OPERATION

5.1 - Start/stop control

The table below summarises the unit control type and stop or go status with regard to the following parameters.

- **Operating type**: this is selected using the start/stop button on the front of the user interface.
- **Remote start/stop contacts**: these contacts are used when the unit is in remote operating type (Remote mode).
- **CHIL_S_S**: this network command relates to the chiller start/stop when the unit is in CCN control (CCN mode). Variable forced to disable: the unit is halted. Variable forced to Enable: the unit runs in accordance with schedule 1.
- **Start/Stop schedule**: occupied or unoccupied status of the unit as determined by the chiller start/stop program (Schedule 1).
- **Master control type**. This parameter is used when the unit is the master unit in a two chiller lead/lag arrangement. The master control type determines whether the unit is to be controlled locally, remotely or through CCN (this parameter is a Service configuration).
- **CCN emergency shutdown**: if this CCN command is activated, it shuts the unit down whatever the active operating type.
- **General alarm**: the unit is totally stopped due to failure.

Active operating type							**Parameter status**					**Control**	**Unit**
Local-Off	Local-On	Local-Schedule	Remote mode	CCN mode	Master mode	CHIL_S_S	Remote start/stop contact	Master unit control type	Start/stop schedule mode	CCN emergency shut-down	General alarm	type	status
-	-	-	-	-	-	-	-	-	-	Active	-	-	Off
-	-	-	-	-	-	-	-	-	-	-	Yes	-	Off
Active	-	-	-	-	-	-	-	-	-	-	-	Local	Off
-	-	Active	-	-	-	-	-	-	Unoccupied	-	-	Local	Off
-	-	-	Active	-	-	-	Off	-	-	-	-	Remote	Off
-	-	-	Active	-	-	-	-	-	Unoccupied	-	-	Remote	Off
-	-	-	-	Active	-	Off	-	-	-	-	-	CCN	Off
-	-	-	-	Active	-	-	-	-	Unoccupied	-	-	CCN	Off
-	-	-	-	-	Active	-	-	Local	Unoccupied	-	-	Local	Off
-	-	-	-	-	Active	-	Off	Remote	-	-	-	Remote	Off
-	-	-	-	-	Active	-	-	Remote	Unoccupied	-	-	Remote	Off
					Active	Off	-	CCN	-	-	-	CCN	Off
-	-	-	-	-	Active	-	-	CCN	Unoccupied	-	-	CCN	Off
-	Active	-	-	-	-	-	-	-	-	Disabled	No	Local	On
-	-	Active	-	-	-	-	-	-	Occupied	Disabled	No	Local	On
-	-	-	Active	-	-	-	On	-	Occupied	Disabled	No	Remote	On
-	-	-	-	Active	-	On	-	-	Occupied	Disabled	No	CCN	On
-	-	-	-	-	Active	-	-	Local	Occupied	Disabled	No	Local	On
-	-	-	-	-	Active	-	On	Remote	Occupied	Disabled	No	Remote	On
-	-	-	-	-	Active	On	-	CCN	Occupied	Disabled	No	CCN	On

5.2 - Unit stop function

This function controls the unit compressor capacity reduction. If there is an alarm or a demand to stop it forces the compressors to the minimum capacity and waits for the slide valve to position itself correctly. The waiting time depends on the currents measured and on the compressor type.

This stop sequence is not followed, if a water heat exchanger frost protection or low suction temperature alarm exists. Once the circuit minimum capacity has been reached, a pumpdown session is started to protect the evaporator against frost, based on the outside temperature.

For units operating at a high outside temperature or without the evaporator heater option, this pumpdown session is not required. Once the circuit has stopped, the EXV waits for the equalisation of the pressures or one minute, before it closes completely.

5.3 - Evaporator water pump control

The unit can control one or two evaporator water pumps. The pumps are turned on when this option is configured (see User Config sub-menu) and when the unit is in one of the on modes described above or in delay mode. Since the minimum value for the delay at start-up is 1 minute (configurable between 1 and 15 minutes), the pump will run for at least one minute before the first compressor starts. The pump is kept running for 20 seconds after the unit goes to stop mode.

It is turned off, if the unit is shut down due to an alarm, unless the fault is a frost protection fault. The pump can be started in particular operating conditions when the evaporator heater is active. See section 5.14 for the particular evaporator pump control for the follower unit (master/slave assembly).

If two pumps are controlled and the reversing function has been selected (see User 1 configuration), the control tries to limit the pump run time delta to the configured pump changeover delay. If this delay has elapsed, the pump reversing function is activated, when the unit is running. During the reversing function both pumps run together for two seconds.

If a pump has failed and a secondary pump is available, the unit is stopped and started again with this pump.

The control provides a means to automatically start the pump each day at 14.00 hours for 2 seconds when the unit is off. If the unit is fitted with two pumps, the first pump is started on odd days and the second pump is started on even days. Starting the pump periodically for few seconds increases the life-time of the pump bearings and the tightness of the pump seal.

5.4 - Water flow switch

The new controller is configurable. The configuration depends on the unit size and is made at the start-up. If the measured flow rate in the water loop is lower than the configured flow rate, an alarm condition shuts off the unit.

5.5 - Heating/cooling selection

For water-cooled units configured in the Heat Machine mode, heating/cooling selection can be controlled in various ways, depending on the active operating type:

- locally at the unit using the HC_SEL item on default screen 1,
- remotely via the heating/cooling selection contact, if the unit is in the Remote mode operating type,
- via a CCN network command, if the unit is in the CCN operating type.

Parameter status					
On/off status	**Control type**	**Heating/cooling selection in local mode**	**Heating/cooling contact in local mode**	**HC_SEL**	**Operating mode**
Off	-	-	-	-	Cooling
On	Local	Cooling	-	-	Cooling
On	Local	Heating	-	-	Heating
On	Remote	-	On cooling	-	Cooling
On	Remote	-	On heating	-	Heating
On	CCN	-	-	Cooling	Cooling
On	CCN	-	-	Heating	Heating

5.6 - Control point

The control point represents the water temperature that the unit must produce.

In cooling mode the evaporator outlet water is controlled by default, but the evaporator inlet water can also be controlled (requires a Service configuration modification).

In heating mode (water-cooled units only), the condenser outlet water is controlled by default, but the condenser inlet water can also be controlled (requires a Service configuration modification).

Control point = active setpoint + reset

5.6.1 - Active setpoint

Two setpoints can be selected. Usually, the second cooling setpoint is used for unoccupied periods. Depending on the current operation type, the active setpoint can be selected by choosing the item in the table Status => Genunit, with the volt-free user contacts, with network commands or with the setpoint timer program (schedule 2).

The following tables summarise the possible selections depending on the control types (local, remote or network) and the following parameters:

- **Setpoint select in local control**: item “Setpoint select” in the table Status => Genunit permits selection of the active setpoint, if the unit is in local operating type.
- **Control contacts 2:** status of control contact 2.
- **Schedule 2 status:** schedule for setpoint selection.

LOCAL OPERATING MODE

Parameter status					Active setpoint
Heating/cooling operating mode	Local setpoint selection	Ice storage configuration*	Ice storage contact status*	Schedule 2 status	
Cooling	csp 1	-	-	-	Cooling setpoint 1
Cooling	csp 2	-	-	-	Cooling setpoint 2
Cooling	auto	Activated	Open	Unoccupied	Ice storage setpoint
Cooling	auto	Activated	Closed	Unoccupied	Cooling setpoint 2
Cooling	auto	-	-	Occupied	Cooling setpoint 1
Cooling	auto	Deactivated	-	Unoccupied	Heating setpoint 2
Heating	hsp 1	-	-	-	Heating setpoint 1
Heating	hsp 2	-	-	-	Heating setpoint 2
Heating	auto	-	-	Occupied	Heating setpoint 1
Heating	auto	-	-	Unoccupied	Heating setpoint 2

REMOTE OPERATING MODE

Parameter status					Active setpoint
Heating/cooling operating mode	Local setpoint selection	Ice storage configuration*	Ice storage contact status*	Control contact 2	
Cooling	csp control	-	-	-	Control setpoint
Cooling	-	-	-	csp 1 (open)	Cooling setpoint 1
Cooling	-	-	-	csp 2 (closed)	Cooling setpoint 2
Cooling	-	Activated	-	Open	Cooling setpoint 1
Cooling	-	Activated	Open	Closed	Ice storage setpoint
Cooling	-	Activated	Closed	Closed	Cooling setpoint 2
Heating	-	-	-	Open	Heating setpoint 1
Heating	-	-	-	Closed	Heating setpoint 2

NETWORK OPERATING MODE

Parameter status					Active setpoint
Heating/cooling operating mode		Ice storage configuration*	Ice storage contact status*	Schedule 2 status	
Cooling	-	-	-	Occupied	Cooling setpoint 1
Cooling	-	-	-	Unoccupied	Cooling setpoint 2
Cooling	-	Activated	Open	Unoccupied	Ice storage setpoint
Cooling	-	Activated	Closed	Unoccupied	Cooling setpoint 2
Heating	-	-	-	Occupied	Heating setpoint 1
Heating	-	-	-	Unoccupied	Heating setpoint 2

* Only with energy management option

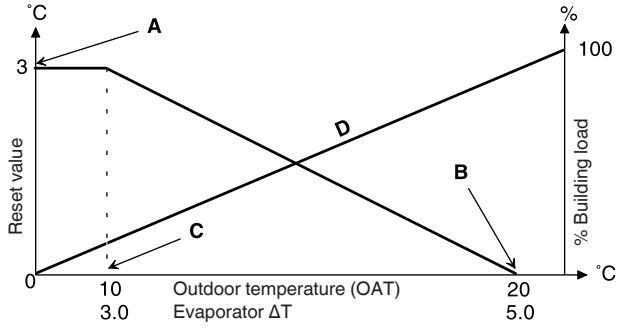
5.6.2 - Reset

Reset means the active setpoint is modified so that less machine capacity is required (in cooling mode the setpoint is increased, in heating mode it is decreased). This modification is in general a reaction to a drop in the load. For the Pro-Dialog control system, the reset source can be configured in the menu Status => User: it can be provided either by the outdoor temperature (gives a measure of the load trends for the building) or by the return water temperature (ΔT - gives an average building load) or by the reset setpoint (only available with the energy management option). In response to a drop in outdoor temperature or to a drop in ΔT, the cooling setpoint is normally reset upwards to optimise unit performance:

In the three cases the reset parameters, i.e. slope, source and maximum value, are configurable in the Setpoint menu. Reset is a linear function based on three parameters.

- A reference at which reset is zero (outdoor temperature or ΔT - no reset value).
- A reference at which reset is maximum (outdoor temperature or ΔT - full reset value).
- The maximum reset value.

Reset example in cooling mode for the outside temperature



Legend

A Maximum reset value
B OAT or ΔT for zero reset
C OAT or ΔT for full reset
D Building load

5.7 - Demand limit

The demand limit is used to restrict the unit power consumption. The Pro-Dialog control system allows limitation of the unit capacity, using one of two methods:

- by means of user-controlled volt-free contacts. The units without energy management option only have one contact (control contact 3). The units equipped with energy management option permit three demand limit levels (2 contacts). The unit capacity can never exceed the limit setpoint activated by these contacts. The limit setpoints can be modified in the Setpoint table.
- by means of a demand limit setpoint output on the energy management board. The demand limit value in night mode is selectable, if the value is below the selected limit. A limit value of 100% means that the unit can use all capacity stages.

ATTENTION: In certain conditions, the power consumption of water-cooled units can exceed the demand limit threshold to protect the compressors.

5.8 - Current limitation

This function is used via the demand limit function, if current limitation is selected in the menu Config => User.

This function will be disabled if the unit operates in master/slave mode, if it is controlled by a System Manager or if the night mode is active.

Current limitation procedure:
If this function is active, the control calculates the sum of the compressor currents to obtain the total compressor current. If this value exceeds the defined limit, the control commands a reduction of the compressor load, until it is below the limit again. Before loading a capacity stage, the control estimates the future compressor current total and ensures that it does not exceed the limit.

The current limit is the product of the two parameters below:

- The current that corresponds to 100% capacity (CURR_FUL in the menu Config => User).
- The active limit determined either by contact 3 or by the CCN network (DEM_LIM), displayed in the table GENUNIT.

The current limit is displayed in the table GENUNIT (CURR_LIM).

5.9 - Night mode

The night period is defined (see menu Config => User) by a start time and an end time that are the same for each day of the week. During the night period the number of fans operating can be reduced, if the current operating conditions permit this. Moreover the unit capacity may be limited (but a minimum capacity value can be configured).

5.10 - Capacity control

This function adjusts the capacity using the compressor slide valve to keep the heat exchanger water temperature at its setpoint. The control system continuously takes account of the temperature error with respect to the setpoint, as well as the rate of change in this error and the difference between entering and leaving water temperatures, in order to determine the optimum moment at which to add or withdraw capacity.

In addition, the high pressure or low pressure unloading functions can also affect the temperature control accuracy. Compressors are started and stopped in a sequence designed to equalise the number of start-ups (value weighted by their operating time).

5.11 - Head pressure control

The head pressure is controlled by a maximum of ten fans. As an option, a variable-speed controller can control between one and four fans. The head pressure is independently controlled by each circuit, based on the saturated condensing temperature value. It is not necessary to re-enter the head pressure setpoint, as the control constantly adjusts the setpoint to ensure optimal performance and short-circuit protection of the fans.

5.11.1 - Air-cooled units

The condensing pressure of each circuit is generated by ten fans maximum. As an option, a speed variator can be used to control between one and four fans. The condensing pressure is independently controlled in each circuit, based on the saturated condensing temperature. It is not necessary to re-enter the condensing setpoint, as the control permanently adjusts its setpoint to guarantee optimal performance and anti-short-cycle protection of the fans.

5.11.2 – Water-cooled units

Condensing pressure control is assured, if the three-way valve option is selected. The saturated condensing temperature is controlled based on a user configurable fixed setpoint. The three-way valve control can be configurated by the service department.

5.12 - Determining the lead circuit

This function controls the start/stop sequence of the three refrigerant circuits called A, B and C. The circuit authorised to start first is the lead circuit. Two methods can be configured by the user in the menu Config => User.

- Auto mode: the control system determines the lead circuit to equalise the operating time of each circuit (value weighted by the number of start-ups of each circuit). This way the circuit with the least operating hours always starts first.
- Circuit A, B or C as lead circuit: the circuit selected is always the leader. It is the first to start and the last to stop.

5.13 - Circuit loading sequence

This function determines in which order the capacity in each circuit must be modified. It is controlled by starting and stopping the compressors and using the slide valve.

There are two sequence types that can be configured by the user via CCN or via the user interface:
- Balanced circuit loading: the control tries to maintain an identical loading value for all circuits, whether the unit is loaded or unloaded.
- Loading with priority given to one circuit: the control fully loads the lead circuit, before starting the other circuits. If the load decreases, the lag circuits are unloaded first.

Staged loading by circuit will be selected if one of these configurations occurs:
- one circuit is shut down due to a breakdown,
- one circuit is in capacity override mode,
- the other circuits are shut down or fully charged.

To find out more about the capacity loading and unloading sequence, see section 7 “Capacity loading sequence“.

5.14 - Master/slave assembly

Two Pro-Dialog units can be linked to produce a master/slave assembly. The two machines are interconnected over the CCN bus. All parameters required for the master/slave function must be configured through the menu config => MST_SLV. If the heat exchanger leaving water temperature is controlled, master/slave operation requires the connection of a temperature probe on the common manifold.

This probe is not required, if the entering water temperature is controlled, or if the installation is a series type system (the water inlet is via the slave unit and the water outlet to be controlled is that of the master unit).

The master/slave assembly can operate with constant or variable flow. In the case of variable flow each machine must control its own water pump and automatically shut down the pump, if the cooling capacity is zero. For constant flow operation the pumps for each unit are continuously operating, if the system is operating. The master unit can control a common pump that will be activated, when the system is started. In this case the slave unit pump is not used.

All control commands to the master/slave assembly (start/stop, setpoint, heating/cooling operation, load shedding, etc.) are handled by the unit which is configured as the master, and must therefore only be applied to the master unit. They will be transmitted automatically to the slave unit. The master unit can be controlled locally, remotely or by CCN commands. Therefore to start up the assembly, simply validate the Master operating type (Master mode) on the master unit. If the Master has been configured for remote control then use the remote volt-free contacts for unit start/stop. The slave unit must stay in CCN operating type continuously. To stop the master/slave assembly, select Local Off (Local-off) on the master unit or use the remote volt-free contacts if the unit has been configured for remote control.

One of the functions of the master unit (depending on its configuration) may be the designation, whether the master or slave is to be the lead machine or the follower. The roles of lead machine and follower will be reversed when the difference in running hours between the two units exceeds a configurable value, ensuring that the running times of the two units are automatically equalised. The changeover between lead machine and follower may take place when the assembly is started up, or even whilst running. The running time balancing function is not active if it has not been configured: in this case the lead machine is always the master unit.

The lead machine will always be started first. When the lead machine is at its full available capacity, start-up delay (configurable) is initialised on the follower. When this delay has expired, and if the error on the control point is greater than 1.7 K, the follower unit is authorised to start and the pump is activated. The follower will automatically use the master unit active setpoint. The lead machine will be held at its full available capacity for as long as the active capacity on the follower is not zero. When the follower unit receives a command to stop, its evaporator water pump is turned off with 20 seconds delay.

In the event of a communication fault between the two units, each shall return to an autonomous operating mode until the fault is cleared. If the master unit is halted due to an alarm, the slave unit is authorised to start without prior conditions.

5.15 - Optional heat reclaim module

For all air-cooled units equipped with water heat reclaim condenser only, this option requires the installation of an additional NRCP2 type board.

This board allows control of:
- A heat reclaim condenser pump,
- A heat reclaim condenser heater,
- Two motorised valves to shut off the air condenser (one for each circuit),
- Two solenoid drain valves for the air condenser (one for each circuit),
- Two motorised valves to shut off the water condenser (one for each circuit),
- Two solenoid drain valves for the water condenser (one for each circuit).

Selecting the heat reclaim mode can be done with either the local interface or remotely with the (recl_sw) contact or by CCN.

The heat reclaim function is active when: the heat reclaim entering water temperature is lower than the heat reclaim setpoint, minus half of the heat reclaim dead band.

The heat reclaim function is not active when: the heat reclaim entering water temperature is higher than the heat reclaim setpoint, plus half of the heat reclaim dead band.

In the dead band the function remains in its active mode. The default value of the dead band is 4.4 K. This value can be modified by Carrier Service.

Changeover procedure from cooling mode to heat reclaim mode:

- Start-up of the condenser pump.
- Verification of the condenser flow switch control contact. If this remains open after one minute of condenser pump operation, the circuit remains in cooling mode and an alarm will be activated.
- As soon as the saturated condensing temperature reaches 30°C, the pumpdown sequence is activated.
- Pumpdown: opening of the water condenser water inlet valve and closing of the air condenser air valves 3 seconds later. (Attention: The motorised valves take about 90 seconds to reach their stop.)
- After two minutes the heat reclaim function is effective.

5.16 - Water condenser pump control

This control only applies to air-cooled units units equipped with the heat reclaim module option or to water-cooled units.

5.16.1 - Air-cooled units equipped with heat reclaim option

Pump start-up procedure:
If heat reclaim has been selected, and the reclaim temperature corresponds to the demand, the delay between two heat reclaim sessions has passed and the two circuits have not failed during the last changeover in the heat reclaim mode, the pump is started up after the compressor has started.

5.16.2 - Water-cooled units

The condenser water pump is activated, if this item is configured and if the unit is in the on mode or start-up delay mode. The pump switches off, if the unit has shut down due to an alarm, except in the case of a frost protection fault.

5.17 - Energy management option

This option requires the installation of an additional NRCP2 type board. This board permits access to the following functions:

- Reset via 4-20 mA control: see section 5.6.2.
- Ice storage contact: if ice storage control has been configured (menu Config => User), this contact permits activation of the ice storage setpoint.
- User safety loop input: this contact is used for the customer safety loops that require a unit shut-down if it is closed.
- Occupation control override contact: if this contact is closed, the unit enters the occupied mode.
- Demand limit setpoint contact and output: see sections 3.6.4 and 5.7.

This option also permits display of the following data:

- Current unit capacity via 0-10 V output
- Operating status, compressors A, B and C
- Unit ready to start
- Unit completely stopped
- Unit in operation

5.18 - Evaporator heater option

In air-cooled units only, this option requires an additional 8xDO type board. It permits control of four shut-off valves (two per circuit) and an evaporator heater that allows protection of the evaporator against frost, when the unit has shut down. One or two thermistors permit control of the correct heater operation.

NRCP2 board connections - energy management option			
Description	**Connector/ channel**	**Type**	**Remarks**
Outside temperature	J6 / Ch02	Analogue input	Active setpoint reset via outside temperature control. See chapter 5.6.2.
4-20 mA setpoint control reset	J7A / Ch05	4-20 mA analogue input	Active setpoint reset. See chapter 5.6.2.
4-20 mA setpoint control reset	J7B / Ch06	4-20 mA analogue input	Active setpoint reset via unit capacity control. See chapter 5.6.2.
Occupation control override	J4 / Ch08	Numerical input	If the contact is closed, the unit goes into occupied mode
Demand limit	J4 / Ch09	Numerical input	See chapters 3.6.4. and 5.6.
User safety loop	J4 / Ch10	Numerical input	Permits immediate unit shut-down
Ice storage	J4 / Ch11	Numerical input	
Unit capacity	J8 / Ch07	Analogue output	0-10 V output
Status compressor A	J2A / Ch17	Numerical output	Output set to “On” if compressor A is operating
Status compressor B	J2A / Ch18	Numerical output	Output set to “On” if compressor B is operating
Status compressor C	J2A / Ch19	Numerical output	Output set to “On” if compressor C is operating
Unit ready to start	J2B / Ch23	Numerical output	Output set to “On” if the unit ist ready to start
Unit completely stopped	J3 / Ch24	Numerical output	Output set to “On” if the unit has completely stopped due to an alarm
Unit in operation	J3 / Ch25	Numerical output	Output set to “On” if the unit is in operation

5.19 - Free cooling option

In air-cooled units only, this option permits direct use of the outside temperature to cool the water circuit without using the compressors. This system works only, if the outside temperature is lower than the water circuit temperature.

The direct-expansion free cooling system uses the principle of the natural migration of the refrigerant from the evaporator to the condenser. The fans and a refrigerant pump ensure the transfer of the liquid refrigerant from the condenser to the evaporator, which explains the very low power consumption.

The free cooling option is only available on two-circuit units. It requires an additional electronic expansion valve (EXV) board controlling two free-cooling EXVs as well as two AUX2 boards (8 DOs) that control the operation of the motorised mechanical cooling-free cooling changeover valves and the operation of the refrigerant pump.

If the evaporator heater option and the free cooling option are combined, the free cooling option controls the valves of the evaporator heater option directly. Moreover the evaporator heater is directly controlled by an AUX2 board of the free cooling option. The AUX2 board of the evaporator heater option is then no longer used.

The free cooling option permits automatic operation and combined operation of mechanical cooling (compressor operation) and free cooling. Each refrigerant circuit can operate independently.

Possible combinations:
- two circuits in mechanical cooling,
- two circuits in free cooling,
- one circuit in mechanical cooling and one circuit in free cooling.

Three criteria decide if free cooling is used or not:
- the temperature difference between the outside air temperature and the controlled water temperature: the threshold is configurable by user parameter (USER table, item free_dt),
- the maximum operating time in free cooling, when the water temperature setpoint is not reached (USER table, item fc_tmout),
- contact 4, terminal J4 ch14 permits the customer to keep the unit in mechanical cooling.

5.20 - Optional hydronic kit

This option requires an additional 4xAI 8xDO board. It permits replacing the pressure gauges by electronic pressure sensors.

The hydronic kit allows access to the following functions:
- pressure before and after the evaporator
- pressure before and after the pump filter
- evaporator flow rate
- evaporator capacity

The flow rate is calculated from the pressure difference between the evaporator inlet and outlet and the evaporator pressure drop curves.

The capacity is calculated from the flow rate, from the water constant and from the temperature difference between the entering and leaving evaporator water temperature.

The flow rate and capacity calculations are not carried out, if the unit is configured for brine.

These values are only given as guidelines and should not be regarded as precise values.

If there is a risk of pump cavitation, an alert is activated.

5.21 - Black box function

The Pro-Dialog control registers the values of several predefined variables every 5 seconds. If an operation alarm appears, the control saves a data set of 80 registrations (75 preceding the alarm and 5 following it), for a duration of 7 minutes of unit operation.

Each registration is associated with a time schedule defined in hours, minutes and seconds. The control can store a maximum of six data sets in the memory. They can be recovered by a Carrier service technichian, using a winDCT tool that permits recovery and later removal of the data sets from the unit.

5.22 - Option for high condensing temperatures

For water-cooled units only, this option allows an increase of the maximum condensing threshold. This means that the saturated condensing temperature can reach a maximum of 68°C, compared with a maximum of 53°C for units that are not equipped with this option.

5.23 - Maximum condenser leaving water temperature = 45°C (option)

For water-cooled units only, this option allows the user to limit the condenser leaving water temperature to 45°C. When the condensing temperature reaches 44°C, the increase in the compressor loading is stopped. When the temperature exceeds 45°C, the compressor is unloaded.

6 - DIAGNOSTICS - TROUBLESHOOTING

6.1 - General

The Pro-Dialog control system has many fault tracing aid functions. The local interface and its various menus give access to all unit operating conditions. If an operating fault is detected, an alarm is activated and an alarm description is stored in the Alarm menu.

6.2 - Displaying alarms

The alarm LED on the interface (see section 4.1) gives an immediate display of the unit status.

- A flashing LED shows that the unit is operating but there is an alarm.
- A steady LED shows that the unit has been shut down due to a fault.

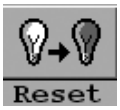
The ALAM_CUR table in the Alarms menu (see section 4.4.3) on the main interface displays up to 10 fault codes that are active on the unit (in case of a total disconnection from the slave boards).

6.3 - Resetting alarms

When the cause of the alarm has been corrected the alarm can be reset, depending on the type, either automatically on return to normal, or manually when action has been taken on the unit. Alarms can be reset even if the unit is running.

This means that an alarm can be reset without stopping the machine. In the event of a power supply interrupt, the unit restarts automatically without the need for an external command. However, any faults active when the supply is interrupted are saved and may in certain cases prevent a circuit or a unit from restarting.

A manual reset must be carried out from the main interface and requires pushing the Reset button in the main menu.



A confirmation must then be carried out. The alarm LED then goes off and confirms the reset.

6.4 - Alarm codes

Alarm No.	GENUNIT code*	Description of the alarm text	Reset type	Action taken by the control	Probable cause
THERMISTOR FAULTS					
1	th-01	Evaporator entering water thermistor fault	Automatic if the temperature measured by the sensor returns to normal	Unit shuts down	Defective thermistor
2	th-02	Evaporator leaving water thermistor fault	As above	Unit shuts down	As above
3	th-06	Condenser entering water thermistor fault	As above	None	As above
4	th-07	Condenser leaving water thermistor fault	As above	None	As above
7	th-08	Heat reclaim condenser entering water thermistor fault	As above	Unit returns to air-cooled mode	As above
8	th-09	Heat reclaim condenser leaving water thermistor fault	As above	None	As above
9	th-10	Outside temperature sensor fault	As above	Unit shuts down	As above
10	th-11	Common water master/slave thermistor fault	As above	Unit returns to stand-alone mode	As above
11	th-12	Suction gas temperature sensor fault, circuit A	As above	Circuit A shuts down	As above
12	th-13	Suction gas temperature sensor fault, circuit B	As above	Circuit B shuts down	As above
13	th-14	Suction gas temperature sensor fault, circuit C	As above	Circuit C shuts down	As above
14	th-15	Discharge gas temperature sensor fault, circuit A	As above	Circuit A shuts down	As above
15	th-16	Discharge gas temperature sensor fault, circuit B	As above	Circuit B shuts down	As above
16	th-17	Discharge gas temperature sensor fault, circuit C	As above	Circuit C shuts down	As above
17	th-18	Condenser subcooling temperature sensor fault, circuit A	As above	Unit returns to air-cooled mode	As above
18	th-19	Condenser subcooling temperature sensor fault, circuit B	As above	Unit returns to air-cooled mode	As above
19	th-21	Ambient temperature sensor fault	As above	No action, simply warning	As above
20	th-22	Evaporator heater status return thermistor fault	As above	No action, simply warning	As above
21	th-24	Economizer gas temperature sensor fault, circuit A	As above	Deactivation of the economizer function by closing the economizer EXV	As above
22	th-25	Economizer gas temperature sensor fault, circuit B	As above	As above	As above
23	th-26	Economizer gas temperature sensor fault, circuit C	As above	As above	As above
24	th-30	Liquid refrigerant temperature sensor fault, free cooling option, circuit A	As above	Deactivation of the free cooling mode, circuit A	As above
25	th-31	Liquid refrigerant temperature sensor fault, free cooling option, circuit B	As above	Deactivation of the free cooling mode, circuit B	As above
PRESSURE TRANSDUCERS					
26	Pr-01	Discharge transducer fault, circuit A	Automatic, if the voltage transmitted by the sensor returns to normal	Circuit A shuts down	Transducer fault or installation fault
27	Pr-02	Discharge transducer fault, circuit B	As above	Circuit B shuts down	As above
28	Pr-03	Discharge transducer fault, circuit C	As above	Circuit C shuts down	As above
29	Pr-04	Suction transducer fault, circuit A	As above	Circuit A shuts down	As above
30	Pr-05	Suction transducer fault, circuit B	As above	Circuit B shuts down	As above
31	Pr-06	Suction transducer fault, circuit C	As above	Circuit C shuts down	As above
32	Pr-07	Heat reclaim pumpdown transducer, circuit A	As above	Return to air-cooled mode	As above
33	Pr-08	Heat reclaim pumpdown transducer, circuit B	As above	As above	As above
34	Pr-10	Oil pressure transducer, circuit A	As above	Circuit A shuts down	As above
35	Pr-11	Oil pressure transducer, circuit B	As above	Circuit B shuts down	As above
36	Pr-12	Oil pressure transducer, circuit C	As above	Circuit C shuts down	As above
37	Pr-13	Economizer pressure transducer, circuit A	As above		As above
38	Pr-14	Economizer pressure transducer, circuit B	As above		As above
39	Pr-15	Economizer pressure transducer, circuit C	As above		As above
40	Pr-16	Upstream pressure transducer, free cooling pump, circuit A	As above	Deactivation of the free cooling mode, circuit A	As above
41	Pr-17	Upstream pressure transducer, free cooling pump, circuit B	As above	Deactivation of the free cooling mode, circuit B	As above
42	Pr-18	Downstream pressure transducer, free cooling pump, circuit A	As above	Deactivation of the free cooling mode, circuit A	As above
43	Pr-19	Downstream pressure transducer, free cooling pump, circuit B	As above	Deactivation of the free cooling mode, circuit B	As above
46	Pr-24	Fault, water pressure transducer 1 (before the evaporator)	Automatic	Alert - the values read by the hydronic kit function are not reliable.	Transducer defective or installation fault
47	Pr-25	Fault, water pressure transducer 2 (after the evaporator)	As above	As above	As above
48	Pr-26	Fault, water pressure transducer 3 (before the filter)	As above	As above	As above
49	Pr-27	Fault, water pressure transducer 4 (after the filter)	As above	As above	As above
51	Pr-29	Low water pressure	Automatic	Alert - the unit continues to operate	Water loop pressure too low. Risk of pump cavitation.

* Alarm code in GENUNIT table

6.4 - Alarm codes (cont.)

Alarm No.	GENUNIT code*	Description of the alarm text	Reset type	Action taken by the control	Probable cause
COMMUNICATION WITH SLAVE BOARDS					
53	Co-a1	Communication loss with compressor A board	Automatic if the communication is re-established	Compressor A shuts down	Bus installation fault or defective slave board
54	Co-b1	Communication loss with compressor B board	As above	Compressor B shuts down	As above
55	Co-c1	Communication loss with compressor C board	As above	Compressor C shuts down	As above
56	Co-e1	Communication loss with EXV A board	As above	Circuit A shuts down	As above
57	Co-e2	Communication loss with EXV B board	As above	Circuit B shuts down	As above
58	Co-e3	Communication loss with EXV C board	As above	Circuit C shuts down	As above
59	Co-f1	Communication loss with fan 1 board	As above	Circuit A shuts down, if there are more than 4 fans per circuit, if not circuits B and C shut down	As above
60	Co-f2	Communication loss with fan 2 board	As above	Circuit B shuts down	As above
61	Co-f3	Communication loss with fan 3 board	As above	Circuit C shuts down	As above
62	Co-o1	Communication loss with free cooling 1 board	As above	Circuits A and B shut down	As above
63	Co-o2	Communication loss with free cooling 2 board	As above	Circuit C shuts down	As above
64	Co-o3	Communication loss with energy management board	As above	Unit continues to operate, but the functions linked to the board are deactivated	As above
65	Co-o4	Communication loss with heat reclaim board	As above	Return to air-cooled mode	As above
66	Co-o5	Communication loss with auxiliary board 6	As above	Unit continues to operate, but the functions linked to the board are deactivated	As above
PROCESS FAULTS					
67	P-01	Evaporator frost protection	Automatic, if the same alarm has not tripped during the last 24 hours, if not manual	Unit shuts down. Start-up of the condenser pump, if the unit has shut down.	Lack of water flow or defective thermistor
68	P-02	Condenser frost protection, circuit A	Automatic, if the saturated economizer temperature and the saturated discharge temperature are above 4.4°C	Circuit shuts down. Start-up of the condenser pump, if the unit has shut down.	Discharge pressure transducer defective, refrigerant leak or low condenser water temperature
69	P-03	Condenser frost protection, circuit B	As above	As above	As above
71	P-05	Low suction temperature, circuit A	Automatic, if the temperature returns to normal and the outside temperature is below 10°C and if the same alarm has not tripped during the last 24 hours	Compressor capacity increase or unloading stopped, depending on the temperature value	Pressure sensor, EXV blocked or lack of refrigerant
72	P-06	Low suction temperature, circuit B	As above	As above	As above
73	P-07	Low suction temperature, circuit C	As above	As above	As above
74	P-08	High superheat, circuit A	Manual	Circuit A shuts down	As above
75	P-09	High superheat, circuit B	Manual	Circuit B shuts down	As above
76	P-10	High superheat, circuit C	Manual	Circuit C shuts down	As above
77	P-11	Low superheat, circuit A	Manual	Circuit A shuts down	As above
78	P-12	Low superheat, circuit B	Manual	Circuit B shuts down	As above
79	P-13	Low superheat, circuit C	Manual	Circuit C shuts down	As above
80	P-14	Customer safety loop fault	Automatic, if the same alarm has not tripped during the last 24 hours	Unit shuts down	-
81	P-28	Control box thermostat or power supply phase reversal	Automatic, when the contact closes again	Unit shuts down	Control box poorly ventilated or poor electrical connection
82	P-29	System Manager communication fault	Automatic, when communication is re-established	Unit returns to stand-alone mode	CCN bus installation defective
83	P-30	Master/slave communication fault	As above	-	As above
84	P-67	Low oil pressure, circuit A	Manual	Circuit A shuts down	Pressure sensor or wiring defective or oil filter badly installed
85	P-68	Low oil pressure, circuit B	Manual	Circuit B shuts down	As above
86	P-69	Low oil pressure, circuit C	Manual	Circuit C shuts down	As above
87	P-70	Maximum oil filter pressure differential, circuit A	Manual	Circuit A shuts down	As above
88	P-71	Maximum oil filter pressure differential, circuit B	Manual	Circuit B shuts down	As above
89	P-72	Maximum oil filter pressure differential, circuit C	Manual	Circuit C shuts down	As above
90	P-84	High oil filter pressure drop, circuit A	Manual	None	As above
91	P-85	High oil filter pressure drop, circuit B	Manual	None	As above
92	P-86	High oil filter pressure drop, circuit C	Manual	None	As above
93	P-75	Low oil level, circuit A	Manual	Circuit A shuts down	Oil level too low or oil level detector defective
94	P-76	Low oil level, circuit B	Manual	Circuit B shuts down	As above
95	P-77	Low oil level, circuit C	Manual	Circuit C shuts down	As above

* Alarm code in GENUNIT table

6.4 - Alarm codes (cont.)

Alarm No.	GENUNIT code*	Description of the alarm text	Reset type	Action taken by the control	Probable cause
PROCESS FAULTS (cont.)					
96	MC-nn	Configuration error, master chiller 1 to nn	Automatic, when the master configuration returns to normal or when the unit is no longer in master/slave mode	Unit cannot start in master/slave mode	-
97	FC-n0	No factory configuration	Automatic, when the configuration is entered	Unit cannot start	The unit size has not been configured
98	FC-01 No.1 to nn	Illegal factory configuration	Manual	Unit cannot start	The unit size has been configured with an incorrect value
99	P-31	Unit CCN emergency stop	Manual	Unit shuts down	Network command
100	P-32	Evaporator 1 pump fault	Manual	Unit shut-down except if there is a second pump that can take over	Pump overheating or poor pump connection
101	P-33	Evaporator 2 pump fault	As above	As above	As above
102	P-15	Condenser flow fault	Automatic	Unit shuts down	Defective sensor
103	P-34	Heat reclaim operation failure, circuit A	Manual	Circuit A returns to air-cooled mode	-
104	P-35	Heat reclaim operation failure, circuit B	Manual	Circuit B returns to air-cooled mode	-
105	P-37	Circuit A: condensing pressure outside compressor range	Automatic	Circuit A shuts down	Defective transducer
106	P-38	Circuit B: condensing pressure outside compressor range	Automatic	Circuit B shuts down	As above
107	P-39	Circuit C: condensing pressure outside compressor range	Automatic	Circuit C shuts down	As above
108	P-40	Low saturated suction temperature override repetitions, circuit A	Automatic, if no override has occurred for 30 minutes	None	As above
109	P-41	Low saturated suction temperature override repetitions, circuit B	Automatic, if no override has occurred for 30 minutes	None	As above
110	P-43	Low saturated suction temperature override repetitions, circuit C	Automatic, if no override has occurred for 30 minutes	None	As above
112	P-73	Pump fault, condenser 1	Manual	Unit shuts down	Pump overheats or poor pump connection
114	P-78	High discharge gas temperature, circuit A	Manual	Circuit A shuts down	Defective transducer, max condensing temperature setpoint too low or refrigerant charge too high
115	P-79	High discharge gas temperature, circuit B	Manual	Circuit B shuts down	As above
116	P-80	High discharge gas temperature, circuit C	Manual	Circuit C shuts down	As above
117	P-81	Low economizer pressure or suction valve closed, circuit A	Manual	Circuit A shuts down	Defective transducer or installation fault. In water-cooled units without economizer the suction valve may be closed
118	P-82	Low economizer pressure or suction valve closed, circuit B	Manual	Circuit B shuts down	As above
119	P-83	Low economizer pressure or suction valve closed, circuit C	Manual	Circuit C shuts down	As above
120	P-87	Slide valve not controllable, circuit A	Manual	None, simply warning	Defective or incorrectly wired solenoid valves or defective current transformer
121	P-88	Slide valve not controllable, circuit B	Manual	None, simply warning	As above
122	P-89	Slide valve not controllable, circuit C	Manual	None, simply warning	As above
123	P-90	Flow controller configuration fault	Manual	Unit is not allowed to restart	Defective or incorrectly wired flow controller
124	P-91	Flow controller fault	Conditional if at least one compressor operates, otherwise automatic	Unit shuts down	Evaporator pump defect or water flow switch defect
125	P-94	Fault during free cooling operation, circuit A	The three first times automatic, the 4th time manual	Deactivation of the free cooling mode, circuit A	De-energising of the free cooling pump
126	P-95	Fault during free cooling operation, circuit B	The three first times automatic, the 4th time manual	Deactivation of the free cooling mode, circuit B	De-energising of the free cooling pump
127	P-97	Water heat exchanger temperature sensor reversed	Manual	Unit shuts down	Sensors of the evaporator reversed in cooling mode or of the water condenser in heating mode

* Alarm code in GENUNIT table

6.4 - Alarm codes (cont.)

Alarm No.	GENUNIT code*	Description of the alarm text	Reset type	Action taken by the control	Probable cause
MAINTENANCE ALARM					
128	Sr-nn	Service maintenance alert No. nn	Manual	-	Preventive maintenance date has passed
129	V0-xx	Fault, variable speed controller, circuit A	Manual or automatic	Speed controller fault or alert	The circuit continues to operate, the speed controller slows down the motor. The circuit shuts down.
130	V1-xx	Fault, variable speed controller, circuit B	As above	As above	As above
131	V2-xx	Fault, variable speed controller, circuit C	As above	As above	As above
COMPRESSOR FAULT					
132-01	A1-01	Compressor A1 fault No. 1	See compressor alarm sub-code		
132-nn	A1-nn	Compressor A1 fault No. nn	See compressor alarm sub-code		
133-01	B1-01	Compressor B1 fault No. 1	See compressor alarm sub-code		
133-nn	B1-nn	Compressor B1 fault No. nn	See compressor alarm sub-code		
134-01	C1-01	Compressor C1 fault No. 1	See compressor alarm sub-code		
134-nn	C1-nn	Compressor C1 fault No. nn	See compressor alarm sub-code		

Pro-Dialog user display alarm code	Alarm text and CCN message description	Reset type	Probable cause
COMPRESSOR ALARM SUB-CODE			
XX-01*	Compressor XX: motor temperature too high	Manual	Motor/wiring fault
XX-02*	Compressor XX: motor temperature outside the range	Manual	Probe defective or incorrect wiring
XX-03*	Compressor XX: high pressure switch protection XX	Manual	Coil fouled, lack of condenser flow, condenser valve blocked, fan circuit fault, high entering air or condenser water temperature
XX-04*	Current consumption too high	Manual	-
XX-05*	Compressor XX: locked rotor	Manual	Mechanical compressor fault, motor fault or defective compressor slide valve
XX-06*	Compressor XX: phase L1 lost	Manual	Power supply wiring fault, verify the three phases
XX-07*	Compressor XX: phase L2 lost	Manual	As above
XX-08*	Compressor XX: phase L3 lost	Manual	As above
XX-09*	Compressor XX: low current alarm	Manual	Defective contactor or capacity fault
XX-10*	Current increase fault during the star-delta passage on compressor XX	Manual	Incorrect wiring or no power for the delta contactor
XX-11*	Compressor XX: contactor fault	Manual	Incorrect wiring or defective contactor or TCPM board
XX-12*	Compressor XX: motor stop impossible	Manual	Incorrect wiring or defective contactor
XX-13*	Compressor XX: phase reversal	Manual	-
XX-14*	Compressor XX: MTA configuration fault	Manual	MTA configuration incorrect or defective TCPM board
XX-15*	Compressor XX: incorrect configuration switch	Manual	Configuration switch S1 incorrect wiring or defective TCPM board
XX-16*	Compressor XX: switch modification detected	Manual	As above
XX-17*	Compressor XX: power supply cut during operation of compressor XX	Automatic, saved in the alarm history	Verify that power supply cuts have occurred
XX-18*	Compressor XX: critical software error (UL 1998)	Manual	Power network noise or defective TCPM board
XX-19*	Compressor XX: critical error on two current parameters (UL 1998)	Manual	Power network noise or defective TCPM board

* XX = A1, B1, C1

7 - CIRCUIT CAPACITY LOADING SEQUENCE

7.1 - Dual circuit - balanced capacity loading

Loading sequence (%)		Unloading sequence (%)	
Lead circuit	Lag circuit	Lead circuit	Lag circuit
0	0	100	100
30	0	100	95
35	0	95	95
40	0	95	90
45	0	90	90
50	0	90	85
55	0	85	85
60	0	85	80
65	0	80	80
70	0	80	75
70	30	75	75
70	35	75	70
70	40	70	70
70	45	70	65
70	50	65	65
70	55	65	60
70	65	60	60
70	70	60	55
75	70	55	55
75	75	55	50
80	75	50	50
80	80	50	45
85	80	45	45
85	85	45	40
90	85	40	40
90	90	40	35
95	90	40	30
95	95	40	0
100	95	35	0
100	100	30	0
100	100	0	0

7.2 - Dual circuit - priority given to one circuit

Loading sequence (%)		Unloading sequence (%)	
Lead circuit	Lag circuit	Lead circuit	Lag circuit
0	0	100	100
30	0	100	95
35	0	100	90
40	0	100	85
45	0	100	80
50	0	100	75
55	0	100	70
60	0	100	65
65	0	100	60
70	0	100	55
75	0	100	50
80	0	100	45
85	0	100	40
90	0	100	35
95	0	100	30
100	0	95	30
100	30	90	30
100	35	85	30
100	40	80	30
100	45	75	30
100	50	70	30
100	55	70	0
100	60	65	0
100	65	60	0
100	70	55	0
100	75	50	0
100	80	45	0
100	85	40	0
100	90	35	0
100	95	30	0
100	100	0	0

7.3 - Triple circuit - balanced capacity loading

Loading sequence (%)			Unloading sequence (%)		
Lead circ.	Lag circ. 1	Lag circ. 2	Lead circ.	Lag circ.1	Lag circ. 2
0	0	0	100	100	100
30 (15)	0	0	100	100	95
35	0	0	100	95	95
40	0	0	95	95	95
45	0	0	95	95	90
50	0	0	95	90	90
55	0	0	90	90	90
60	0	0	90	90	85
65	0	0	90	85	85
70	30 (15)	0	85	85	85
70	35	0	85	85	80
70	40	0	85	80	80
70	45	0	80	80	80
70	50	0	80	80	75
70	55	0	80	75	75
70	60	0	75	75	75
70	65	0	75	75	70
70	70	0	75	70	70
70	70	30 (15)	70	70	70
70	70	35	70	70	65
70	70	40	70	65	65
70	70	45	65	65	65
70	70	50	65	65	60
70	70	55	65	60	60
70	70	60	60	60	60
70	70	65	60	60	55
70	70	70	60	55	55
75	70	70	55	55	55
75	75	70	55	55	50
75	75	75	55	50	50
80	75	75	50	50	50
80	80	75	50	50	45
80	80	80	50	45	45
85	80	80	45	45	45
85	85	80	45	45	40
85	85	85	45	40	40
90	85	85	40	40	40
90	90	85	40	40	35
90	90	90	40	40	30 (15)
95	90	90	40	40	0
95	95	90	40	35	0
95	95	95	40	30 (15)	0
100	95	95	35	0	0
100	100	95	30 (15)	0	0
100	100	100	0	0	0

7.4 - Triple circuit - priority given to one circuit

Loading sequence (%)			Unloading sequence (%)		
Lead circ.	Lag circ. 1	Lag circ. 2	Lead circ.	Lag circ.1	Lag circ. 2
0	0	0	100	100	100
30 (15)	0	0	100	100	95
35	0	0	100	100	90
40	0	0	100	100	85
45	0	0	100	100	80
50	0	0	100	100	75
55	0	0	100	100	70
60	0	0	100	100	65
65	0	0	100	100	60
70	0	0	100	100	55
75	0	0	100	100	50
80	0	0	100	100	45
85	0	0	100	100	40
90	0	0	100	100	35
100	0	0	100	100	30 (15)
100	30 (15)	0	100	95	30 (15)
100	35	0	100	90	30 (15)
100	40	0	100	85	30 (15)
100	45	0	100	80	30 (15)
100	50	0	100	75	30 (15)
100	55	0	100	70	30 (15)
100	60	0	100	65	0
100	65	0	100	60	0
100	70	0	100	55	0
100	75	0	100	50	0
100	80	0	100	45	0
100	85	0	100	40	0
100	90	0	100	35	0
100	100	0	100	30 (15)	0
100	100	30 (15)	95	30 (15)	0
100	100	35	90	30 (15)	0
100	100	40	85	30 (15)	0
100	100	45	80	30 (15)	0
100	100	50	75	30 (15)	0
100	100	55	70	30 (15)	0
100	100	60	65	0	0
100	100	65	60	0	0
100	100	70	55	0	0
100	100	75	50	0	0
100	100	80	45	0	0
100	100	85	40	0	0
100	100	90	35	0	0
100	100	95	30 (15)	0	0
100	100	100	0	0	0

(15) Minimum capacity for standard water-cooled units (without option for high condensing temperature)

Environmental Management System Approval

Carrier

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Manufacturer reserves the right to change any product specification without notice.

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